Damage Control Plan for International Space Station Recharge Tank Assembly Composite Overwrapped Pressure Vessel

As NASA has retired the Space Shuttle Program, a new method of transporting compressed gaseous nitrogen and oxygen needed to be created for delivery of these crucial life support resources to the International Space Station (ISS). One of the methods selected by NASA includes the use of highly pressurized, unprotected Recharge Tank Assemblies (RTAs) utilizing Composite Overwrapped Pressure Vessels (COPVs). A COPV consists of a thin liner wrapped with a fiber composite and resin or epoxy. It is typically lighter weight than an all metal pressure vessel of similar volume and therefore provides a higher-efficiency means for gas storage. However COPVs are known to be susceptible to damage resulting from handling, tool drop impacts, or impacts from other objects. As a result, a comprehensive Damage Control Plan has been established to mitigate damage to the RTA COPV throughout its life cycle. The DCP is intended to evaluate and mitigate defined threats during manufacturing, shipping and handling, test, assembly level integration, shipment while pressurized, launch vehicle integration and mission operations by defining credible threats and methods for preventing potential damage while still maintaining the primary goal of resupplying ISS gas resources. A comprehensive threat assessment is performed to identify all threats posed to the COPV during the different phases of its lifecycle. The threat assessment is then used as the basis for creating a series of general inspection, surveillance and reporting requirements which apply across all phases of the COPV's life, targeted requirements only applicable to specific work phases and a series of training courses for both ground personnel and crew aboard the ISS. A particularly important area of emphasis deals with creating DCP requirements for a highly pressurized, large and unprotected RTA COPV for use during Inter Vehicular Activities (IVA) operations in the micro gravity environment while supplying pressurized gas to the ISS for crew life support.